Remarks

Claims 1, 3-9, 18-25, 28 and 29 are currently pending in the application. In the Office Action, allowability of claims 1, 3-9, 18-25, 28 and 29 has been withdrawn in view of new ground of rejection. Claims 1, 3-9, 18-25, 28 and 29 are rejected.

In the instant Amendment, claim 1 has been amended to recite having 0.03 to 0.1% of Mo. Support for this amendment is found in the specification, e.g., on p. 31, ll. 13-15. Claim 28 has been amended similarly. Claim 7 has been amended to delete the last three lines of the text, which was added to claim 7 in the Amendment filed on July 1, 2010 by error. Accordingly, no new matter has been introduced by the present amendment.

Entry of the foregoing amendments and consideration of the following remarks are respectfully requested.

Claim rejections under 35 U.S.C. §103

Claims 1, 3-9, 18-25, and 28 are rejected under 35 U.S.C. §103(a) as being unpatentable over the English translation (machine translated) of JP 2001-288512 to Toshinaga, et al. ("JP '512") alone or in view of U.S. Patent No. 3,733,195 to Nishi ("US '195") for the reasons set forth on pages 2-4 of the Office Action.

While not acquiescing to Examiner's rejection, the claims have been amended herein to expedite prosecution of the current application. In particular, claim 1 has been amended to recite that the crude oil tank comprises, in mass, 0.03 to 0.1% of Mo.

The present inventors discovered that it is possible to enhance corrosion resistance, or resistance to general corrosion and sludge formation, in the environment in question by adding the recited amounts of Cu and Mo in combination, and optionally W, and limiting the amount of P and S, on the basis of the chemical composition of a welded structure, as shown in Fig. 1 of the specification. In particular, Fig. 1 shows the influence of an addition amount of Mo on the rate of progress of local corrosion of Fe--Cu--Mo steels. The present inventors learned from Fig. 1 that the rate of progress of local corrosion fell to minimum when the Mo content was roughly 0.05 mass % and the local corrosion reduction effect of Mo decreased when its content was 0.1 mass % or more. As a consequence, it became clear that the most desirable Mo addition amount was in the range from 0.03 to 0.07%. Thus, it was concluded based on Fig.1 that a small amount of Mo remarkably decreases the local corrosion rate in case of Fe-Cu-Mo steel.

In addition to the required ranges of Mo and W contents, in order to achieve the effect of improving local corrosion resistance more efficiently, it is also necessary to secure at least a certain amount of Mo and W in solid solution. This is because Mo and W can form coarse precipitates, which leads to depletion of the element(s) around the precipitates and the effect of improving local corrosion resistance is impaired. For this reason, it is necessary that either Mo or W be distributed in steel as uniformly as possible. Applicants have discovered that if the total amount of solute Mo and W is 0.005% or more, local corrosion resistance is greatly improved. See, the specification at page 31, line 20, to page 32, line 15.

However, to secure the amount of soluble Mo and W, and avoid forming coarse aggregates, suitable production methods are employed. For example, in the present invention, two methods may be used: a method employing a thermo-mechanical treatment and a method employing a normalizing treatment after hot rolling. Further, a production method for controlling microscopic segregation employing a diffusion heat treatment prior to hot rolling in addition to the above two methods may also be used. See, the specification at page 36, line 34, to page 37, line 28.

JP '512 relates to a method of producing high tensile strength steel excellent in toughness and ductility by means of hot rolling at $\alpha + \gamma$ dual-phase region and obtaining a combined phases of hard and soft phases for securing low yield ratio.

JP '512 teaches increasing toughness and ductility of a steel by the addition of Cu, Mo and W but contains no teachings or suggestions about corrosion resistance. JP '512 does not teach or suggest that a small amount of Mo remarkably decreases the local corrosion rate in case of Fe-Cu-Mo steel. JP '512 teaches that 0.1 to 2% of Mo is added in order to improve the strength of a base material (*see* JP '512, paragraph [0040]), which is much broader than the present invention (i.e., Mo 0.03 to 0.1%). In the Office Action, the Examiner contends that JP '512 discloses steel plate example 4 in Table 1 having a composition that meets claims 1, 4, 5, 7, 18, 21, 22, and 28 and thus having a Ceq closely approximates the claimed Ceq of claim 3. In view of amended claim 1, the Mo content of steel plate example 4 in Table 1 of JP '512 is outside of the claimed range. Thus, JP '512 does not teach or suggest the claimed steel composition.

Furthermore, JP '512 teaches a different production process than the production process of the present invention. In JP '512, the production process comprises the steps of reheating a slab at a temperature range of Ac3 to 1300°C, hot rolling the slab at a starting temperature of less than 950°C and at a finishing temperature of more than 700°C, with a

cumulative reduction rate of 30 to 95%, reheating the hot rolled plate at temperature ranges of more than Ac1 + 20°C and less than Ac3 + 150°C, then accelerated cooling the reheated plate down to a cooling stopping temperature of 300 to 600°C with an accelerated cooling rate of 1 to 100°C/sec (*see* JP '512, at the abstract). Such heat treatment steps are different from that of the present invention. In the present invention, the production methods for securing the amount of Mo and W in solid solution are based on employing the following treatments, 1) a thermo-mechanical treatment or 2) a normalizing treatment. When employing a thermo-mechanical treatment, the accelerated cooling rate is in the range of 0.1 to 4°C/s. When employing a normalizing treatment, the accelerated cooling rate is in the range of 0.5 to 4°C/s. In addition to the above two treatments, a diffusion heat treatment prior to hot rolling is also necessary for controlling microscopic segregation, where the diffusion heat treatment is applied at a heating temperature of 1200 to 1350°C for a retention time of 2 to 100hr (*see* the specification, p. 36, line 34 to p. 37, line 28). Although, claim 7 of JP '512 recites performing solution treatment at 1150-1300°C for 2 to 48 hrs, JP '512, however, does not teach or suggest employing a thermo-mechanical treatment or a normalizing treatment having an accelerate cooling rate in the range of 0.1 to 4°C/s. Thus, a person skilled in the art would not have expected that JP '512 contains the soluble Mo and W in the amount required by the present invention. For at least the reasons presented above, JP '512 fails to teach or suggest the oil tank of the presently claimed invention.

US '195 relates to sea-water corrosion resistant steels having improved weldability. In particular, US '195 relates to steels useful for applications such as ship hulls, buoys, landing piers, base piles, dolphins (marine oil drilling platforms), which are exposed to splashing of sea water, and only parts of ship hulls and oil pipe lines are exposed alternatively or simultaneously to oils, sea-water and plain water (*see* US '195, col. 2, ll. 63-72). US '195 teaches having 0.1-1.50% of Mo or W as an optional element. US '195 does not teach or suggest lowering local corrosion rate by the addition of Mo in Fe-Cu-Mo steel as shown in Fig. 1. US'195 does not teach or suggest the desirability of securing the amount of soluble Mo and/or W, nor process thereof. Further, according to US '195, Cr is an indispensable element and is limited to 0.01-0.50%, preferably adding Cr of more than 0.1% to increase corrosion resistance (*see* US '195 at the abstract). Whereas, in the present invention, Cr content is limited to less than 0.1% because Cr is the element that most increases the local

corrosion rate of progress and thus should be as low as possible (*see* the specification, p.33, ll. 8-19). Thus, US '195 does not cure the deficiencies in JP '512.

Therefore, neither JP '512 alone nor in combination with US '195 renders the claims obvious. Based upon the foregoing arguments, the rejection of claims 1, 3-9, 18-25, and 28 under 35 U.S.C. §103(a) as obvious over JP '512 alone or in view of US '195 cannot stand and should be withdrawn.

Claims 1, 3-9, 18-25, 28 and 29 are rejected under 35 U.S.C. §103(a) as being unpatentable over the English translation (machine translated) of JP 10-147839 to Katsumi, et al. ("JP '839") alone or in view of European opposition document dated January 25, 2010 issued in EP 03760884, filed by Aktiengesellschaft der Dillinger Huttenwerke ("the opposition document") cited by the Applicant in an IDS filed July 6, 2010 and further in view of JP '512 or U.S. Patent No. 5,993,570 to Gray ("US '570") or US '195 for the reasons set for the on pages 4-6 of the Office Action.

JP '839 relates to a steel sheet with high fatigue strength in weld zone so that the occurrence and propagation of cracks in HAZ (heat affected zone) are controlled by means of an area ratio of the ferrite of more than 60%. However, JP '839 does not consider the base material itself because JP '839 only aims to improve HAZ structure and toughness. JP '839 teaches that both Mo and W are optional. JP '839 does not teach or suggest an improvement of corrosion resistance with the addition of Mo and W nor teaches or suggests securing the amount of Mo and W in solid solution.

As discussed above, in order to secure the amount of Mo and W in solid solution in the present invention, specific processes, e.g., a diffusion heat treatment prior to hot rolling, are necessary, and e.g., processes including a thermo-mechanical treatment or a normalizing treatment. On the contrary, according to the production method of JP '839, the slab is heated to 960 to 1150°C and hot rolled to 15-25 mm of board thickness (*see* JP '839, paragraph [0033]). According to the present application, the steels of JP '839 are not expected to contain the amount of soluble Mo and W as required by the presently claimed invention.

In the Office Action, the Examiner acknowledges that JP '839 does not teach steel characterized by solute Mo + solute W $\geq$ 0.005% but contends that the opposition document teaches that Mo is highly soluble in iron and would not precipitate when better precipitators such as Cu, V, or Nb are present. Applicants first respectfully point out that the opposition document relied on by the Examiner was filed long after the filing date of the present

application, and, as such, is not a prior art document. Applicants further respectfully point out that the statements made in the opposition document are merely assertions by counsel, which are not supported by evidence. In this regard, Applicants respectfully point out that, although the opposition document cited a total of 16 references (D1-D7 and E1-E9), it does not identify a single reference regarding the amount of soluble Mo and/or W, but has to resort to assertions of counsel. Thus, a person skilled in the art would not have sought to improve the corrosion resistance of steel for crude oil tank based on the teachings of the opposition document and JP '839. In particular, in view of the fact that JP '839 is not concerned with corrosion resistant steels, there is no reason that a person skilled in the art would have expected that any of the steels of JP '839, including steel example 15, would have the desired corrosion resistance. There is thus no reason why he/she would have selected any of the steels of JP '839, including steel example 15. Therefore, the opposition document does not cure the deficiencies in JP '839.

US '570 relates to a high strength line pipe and structural steel that is resistant to attack in even the most severe sour gas or wet sour gas service. US '570 provides a high strength steel having a very low Mn content, yet which is resistant to sour gas (H_2S) degradation and hydrogen-induced cracking (HIC) in the sour gas environment such as NACE TM0284 as disclosed (*see* US '570 col.1, ll. 10-15, ll. 22-25). However, the corrosion caused in a crude oil tank environment of the present invention is quite different from the corrosion caused in the sour gas environment of US '570. A peculiar corrosive environment forms on the inside of an oil tank of a crude oil carrier because the inside of the crude oil tank is exposed to a corrosive environment caused by water, salts and corrosive gas components contained in crude oil. In addition, a large quantity of solid sulfur forms and precipitates on the internal surface of a steel oil tank. This is because SO_2 and H_2S in a gas phase react and form solid sulfur, with the iron rust on a corroded steel plate surface acting as a catalyst (*see* the specification, p.1, line 35 to p.3, line 23). The presently claimed steel exhibits excellent resistance to the corrosion that is caused by the crude oil and is capable of suppressing the formation of the corrosion product (sludge) containing solid sulfur. The steel disclosed in US '570, however, cannot be used to prevent corrosion in a crude oil tank.

Furthermore, although US '570 describes the Mo content is ≤ 0.60%, the Mo contents found in the Examples in Table IV of US '570 are 0.001%, 0.011%, 0.23% and 0.24%, which

are all outside of the range of the claimed steel composition. Thus, US '570 does not cure the deficiencies in JP '839.

As noted above, neither JP '512 nor US '195 teaches or suggests the presently claimed invention. Thus, JP '512 and US '195 do not cure the deficiencies in JP '839.

Accordingly, neither JP '839 alone nor in combination with the opposition document, JP '512, US '570, or US '195 renders the claims obvious. Based upon the foregoing arguments, the rejection of claims 1, 3-9, 18-25, 28 and 29 under 35 U.S.C. §103(a) as obvious over JP '839 alone or in view of the opposition document and further in view of JP '512 or US '570 or US '195 cannot stand and should be withdrawn.

In view of the foregoing amendments and remarks, Applicants respectfully submit that the present application is in condition for allowance. Early and favorable action by the Examiner is earnestly solicited. If the Examiner believes that issues may be resolved by a telephone interview, the Examiner is invited to telephone the undersigned at the number below.

Respectfully Submitted,

Date: November 29, 2010

By: Weining Wang

Weining Wang
Reg. No. 47,164

KENYON & KENYON LLP
One Broadway
New York, New York 10004
Telephone: (212) 425-6438 (direct)
Fax: (212) 425-5288
CUSTOMER NO. 26646